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Earned Value Management

FOR DUMMIES®
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Deltek 2nd Edition

By Kim Koster and Jason Kinder

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Introduction

Welcome to *Earned Value Management For Dummies*, Deltek 2nd Edition, which introduces earned value management (EVM) concepts in an easy-to-understand, accessible format. Regardless of your background in project management, this book provides you a basic yet thorough grounding in EVM principles.

About This Book

This book is designed to introduce EVM concepts to any project professional who is considering the implementation of EVM for the first time. Whether you're a seasoned project manager, a project controls professional, or an executive, this book will give you practical advice on making this journey successful.

No assumptions have been made about previous experience with either project management or EVM, thus providing those who have only recently found themselves operating in an EVM environment the ability to become valued contributors to the project management function.

This book was written by EVM practitioners who have led the implementation of EVM processes and tools at several major corporations. They are currently employed by Deltek and have included some information about Deltek-specific products. The Deltek writers worked with *For Dummies* editors to turn it into a *For Dummies* book.

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Chapter 1

What Is EVM?

In This Chapter

- Examining projects and project management
- Understanding EVM
- Examining the value of EVM
- Getting started

Earned value management (EVM) is simply a set of project management best practices. EVM is a project management methodology, not an additional set of tasks to be performed along with the "normal" project management functions — which are to plan, execute, and assess how the project is performing against the plan. EVM does nothing more than facilitate these tasks, which the project manager must perform one way or another.

It provides an objective measure of progress while delivering early warning indicators through trends and estimates. Just by managing a project, you're already practicing some of the fundamentals of EVM. But EVM takes project management to the next level by providing structure and a common lexicon for the entire team.

This chapter introduces EVM by relating it to basic project management principles — necessary knowledge, because you must understand these principles to understand EVM. This chapter also introduces EVM fundamentals and shows how organizations can benefit from using this process.

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Understanding Projects and Project Management

A *project* is a task that has a specific beginning and end, with a defined product delivered or objective demonstrated at its conclusion. The development of software programs or video games are good examples of projects.

Also, a project has a specific scope, an assigned budget, and a schedule (see Figure 1-1). Failing to achieve the scope, spending more than the allocated budget, or completing the project late each represents some degree of failure in project execution. So, to produce a successful project, manage each component carefully.

Nearly all projects assign a project manager. Fundamentally, project managers are responsible for the following three things:

- **Scope:** The product or service to be delivered (the goal of the project in layman's terms).
- **Schedule:** The time frame of the project, start to finish.
- **Cost:** Things that carry a monetary value (typically people and materials).

The project manager is expected to ensure the project scope will be completely satisfied by the completion of the project, within the allocated budget and specified time frame.

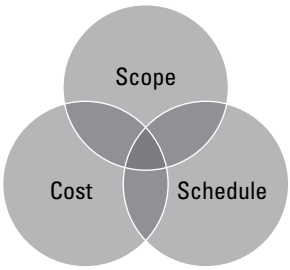

Figure 1-1: A successful project meets all three requirements.

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Everything that the project manager does relates to scope, schedule, or cost. These three components represent project management in a nutshell. A project manager has many jobs, of course — managing people, contracts, business development, customer and internal demands, technical challenges, and so on. There is never a dull moment in the life of a project manager.

One of the best places to find information about project management is the Project Management Institute.

Understanding EVM

EVM is a project management methodology that integrates scope, schedule, and cost. It is a framework that allows project management professionals to monitor these three components so they have an objective measure of project health. The goal is to reduce subjective progress measurement.

How EVM evolved

EVM sprang up in turn-of-the-20th-century factories, where concepts of planned standards, earned standards, and actual costs were created to refine the manufacturing process. According to Quentin W. Fleming and Joel M. Koppelman, EVM came directly from the factory floor. During the 1960s, the U.S. government selected one of the earliest forms of EVM as its methodology for tracking cost and schedule performance in the Minuteman missile program. EVM was so successful in giving the project management team insight into cost and schedule issues and trends that the U.S. government adopted the process for most of its major development programs.

Today, EVM is recognized by many professional associations such as Project Management Institute (PMI), Association for the Advancement of Cost Engineering International (AACEi), National Defense Industrial Association (NDIA), Program Management Systems Committee (PMSC), American National Standards Institute (ANSI), International Performance Management Council (IPMC), and countless others. Project professionals can choose to become certified practitioners in EVM, raising their value to their organizations.

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One person's feeling that they are "almost finished" is another person's "just started." When measuring project health, try to avoid using subjective measurements as a way to make important decisions. You want feedback from your team, but you want to base your decisions on objective measurements.

At the core of EVM, a budget is established at the activity level, and as work progresses, the cost for each activity is earned, which means you measure the task against the projected budget and timeline. EVM provides a way to measure what was spent and the budgeted amount of the work completed, or *earned value*. For more on how to do this, see Chapter 2.

Why Use EVM in the First Place?

Reasons to use EVM vary. Some companies get started with it because a client requires it. In other companies (probably not yours), EVM is considered because of a history of underperforming projects. It could have been a flat-out project failure where you experienced a significant cost or schedule overrun that reduced the profitability of a project or maybe the project just didn't earn the profit percentage originally planned for. Regardless of the case, EVM can improve the likelihood of project success and, therefore, company success.

But the main reason to use EVM is that it works. According to Deltek's published report entitled *Clarity Focus on Program Management,* just 27 percent of the projects surveyed required EVM, yet 43 percent of projects implemented EVM anyway. This is concrete evidence that organizations find EVM to be an effective project management methodology.

In fact, statistics show that once a project is 15 percent complete, program performance doesn't significantly improve during the period between 15 and 85 percent. In other words, you can usually make a pretty good forecast of where a project is going based on where it's already been — making historical information a good indicator of final performance.

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Looking at the great things about EVM

EVM can offer many benefits to organizations. They include:

- Accurate forecast of project completion and final cost
- Objective measurement of accomplishments against scope, schedule, and cost
- Early warnings to delays or overruns
- Information about schedule and cost variances during the course of the project
- Minimizing small changes in the plan that can become large over time *(scope creep)* and that can reduce profitability
- Improvement in the control of contract performance
- Demonstrating a competitive advantage and improving customer goodwill

Other project management methodologies

Don't get hung up with debating which project management methodology is best. In fact, most organizations practicing EVM today use it in conjunction with other project management methodologies, including:

- **Capability Maturity Model Integration (CMMI)** is a process improvement approach that helps organizations improve performance.
- **Six Sigma** seeks to improve process outputs and was made popular by Motorola and General Electric.
- **International Organization for Standardization (ISO)** is a family of standards relating to quality management.
- **Lean manufacturing** is a practice that seeks to eliminate waste.
- **Critical chain project management** seeks to manage resources under the theory of constraints.

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Making a Great Start

Okay, you're convinced EVM is the right thing to do for your project. Now you want to make sure you get off on the right foot. This section goes over some basic steps you need to take.

Follow these steps in order, for best results. Often, steps build on steps, and skipping any one of these can hold up your progress.

The EVM process can be summarized as follows:

1. **Establish the scope.**

   The *scope* of a project defines what is to be developed and delivered. The scope associated with designing a new aircraft, for example, would include specifying size, weight, fuel efficiency, speed, load capability, durability, range, noise, and takeoff and landing distance. The scope is defined in a statement of work (SOW) document and is the basis for schedule and cost. Make sure your entire team agrees on the scope of the project as a first step.

2. **Break down the work.**

   A Work Breakdown Structure (WBS) is a product-oriented hierarchy that breaks your project into manageable chunks of work. Because the WBS is the foundational reporting structure for your project, it should include elements that cover the entire scope of the project.

   A WBS is generally presented in a tree structure to visually break the project into manageable pieces. See Figure 1-2 for an example.

Depending on the industry you work in, there may be standards for how a WBS should be constructed. Both the DoD and NASA define consistent and common WBS standards, and you can find the most recent information on the web. In the construction industry, the Construction Industry Institute offers several standards based on the type of project you're working on. Simply search for these terms in your favorite search engine for the latest releases.

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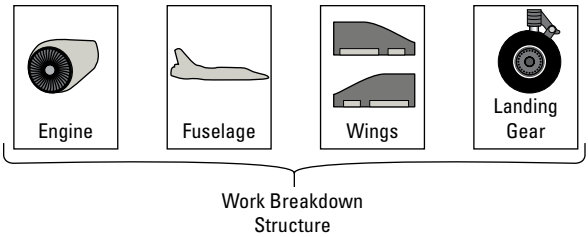

Figure 1-2: A Work Breakdown Structure.

3. **Break down the organization.**

   Next, create the Organizational Breakdown Structure (OBS), a functionally oriented hierarchical structure used to pinpoint organizational responsibilities within a project. See Figure 1-3 for an example.

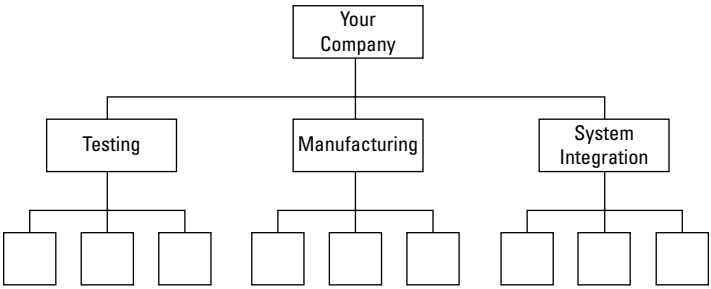

Figure 1-3: The Organizational Breakdown Structure.

4. **Define Control Accounts.**

   The Control Account is the primary management point for your project. It's where the budget for each part of the scope is established, where earned value is analyzed, and where actual costs are collected. The assignment of responsibility is depicted through a Responsibility Assignment Matrix (RAM).

   Traditionally, the control account is defined as the intersection between the WBS (what's going to be done) and the OBS (who's responsible for doing it). See Figure 1-4.

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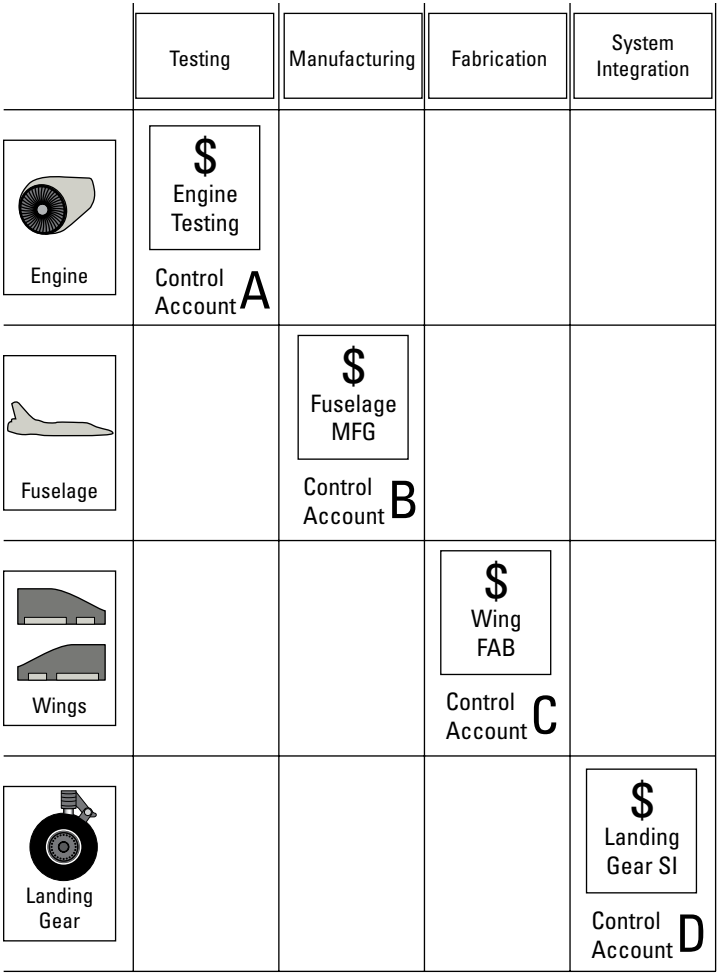

Figure 1-4: Responsibility Assignment Matrix.

5. **Create a schedule.**

   A project schedule contains all the time-phased activities needed to deliver the entire project scope. Create a project schedule and assign a budget to each activity. Although the schedule is tied to the lowest level of the WBS, it's more than just a list of project activities.

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It should include logical relationships among the activities. Once all the activities, durations, and relationships are tied together, you have what is called an Integrated Master Schedule (IMS).

A good way to get started on this is to break down each element from the scope (see Step 1) into discrete activities. Then compile all these activities into your scheduling software to create a project schedule (see Figure 1-5).

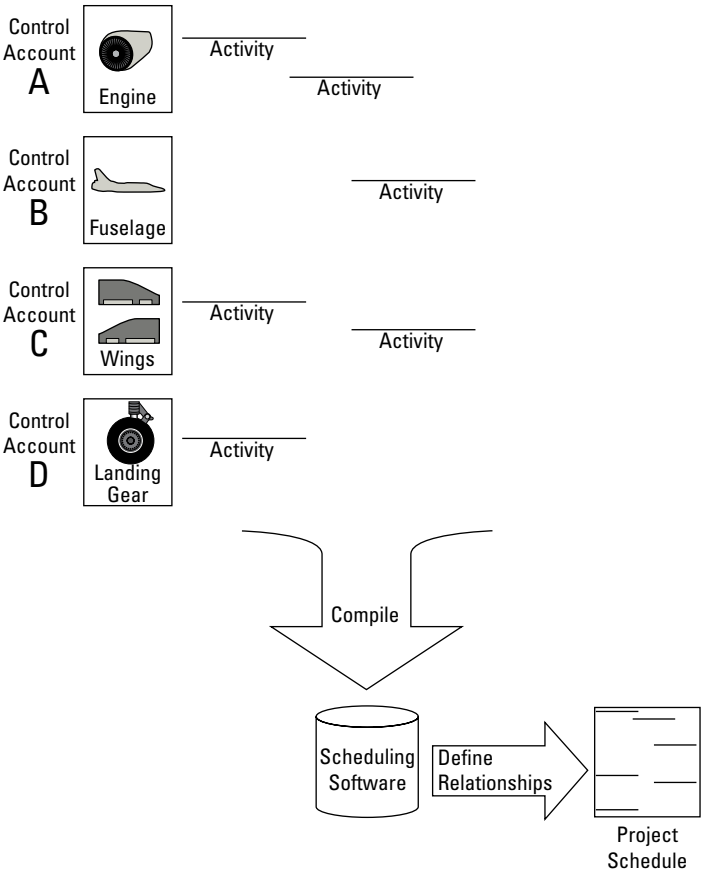

Figure 1-5: Creating a schedule.

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Update the IMS regularly to identify elements that are behind as well as those ahead of schedule. The IMS maps directly to the WBS, providing the project team a single point of reference for all activities.

6. **Create the budget.**

   A project team develops a budget they use to help execute the project. All project budgets are time-phased, which means there is a specification of when the money will be spent. By establishing a time-phased budget, you and your team can figure out how much needs to be spent for each identified time period of the project (see Figure 1-6).

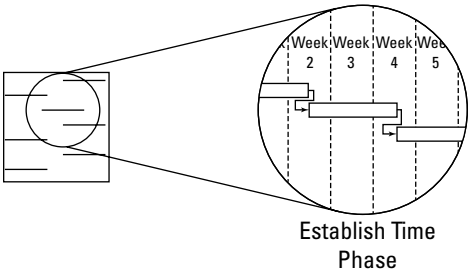

Figure 1-6: Establishing the time phasing of your budget.

After the time phasing is established in your schedule, resource load your schedule by figuring out which resources are needed for each step (see Figure 1-7). Resource loading your schedule is optional, but considered a best practice for EVM.

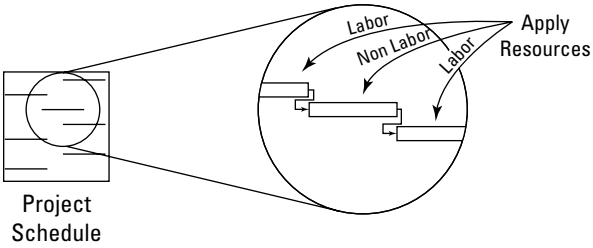

Figure 1-7: Resource loading your schedule.

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There are many benefits to resource loading your schedule, including understanding over allocation of limited resources and availability of resources

Use the resource-loaded schedule to create your total project budget in your EVM software (see Figure 1-8). Once the schedule is resourced it is imported into the earned value software to establish a cost baseline in hours and currency.

One of the fundamentals of EVM is that the schedule must integrate with the cost. In other words, if the schedule says you need to finish on January 30, the budget should also end on January 30.

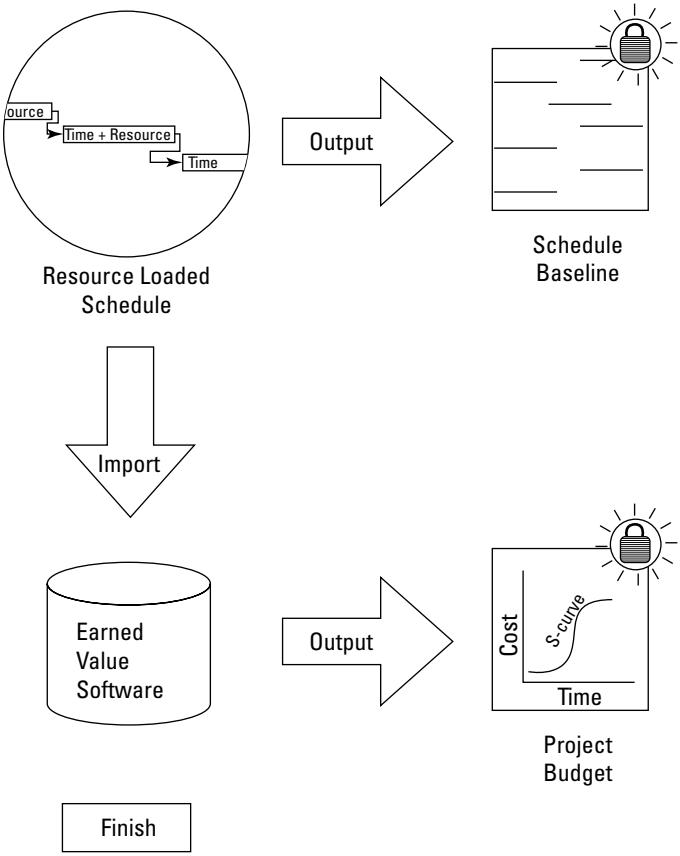

Figure 1-8: Lock down your budget.

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The budget that you just created could be referred to as Planned Value or budgeted cost of work scheduled (BCWS). Your time-phased budget becomes the basis for calculating earned value or budgeted cost of work performed (BCWP).

You now have everything you need to get started with EVM.

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Chapter 2

Managing Projects with EVM

In This Chapter

- Calculating earned value from an initial baseline
- Performing variance analysis
- Keeping an eye on project trends
- Fitting EVM to different types of projects

In this chapter, we explain how to take objective measures of project status, analyze variances that affect a project, determine where a project is in relation to cost and schedule, and avoid surprises by identifying emerging issues.

Measuring Earned Value from an Initial Baseline

If you've read Chapter 1, you understand how to create a time-phased schedule and cost baseline — in EVM terms a *Performance Measurement Baseline (PMB).* The PMB is the sum of all the control account's time-phased budgets plus any undistributed budget that you haven't yet assigned to a control account. This baseline is the benchmark by which you can measure your performance.

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Collecting status information

After you start a project, you need to collect status information on a regular basis — typically weekly or monthly — from the people who are involved in the project (the *responsible resources*).

This status information concerns discrete pieces of work managed in a control account. If your company is constructing a hotel, for example, you might measure progress in a foundation control account.

Status information has two main parts:

- Percentage of schedule activities complete
- Work and cost remaining to complete each activity, called the *estimate to complete* (ETC)

Calculating earned value

After schedule and cost data are collected, that information is integrated into software that calculates earned value (see Figure 2-1).

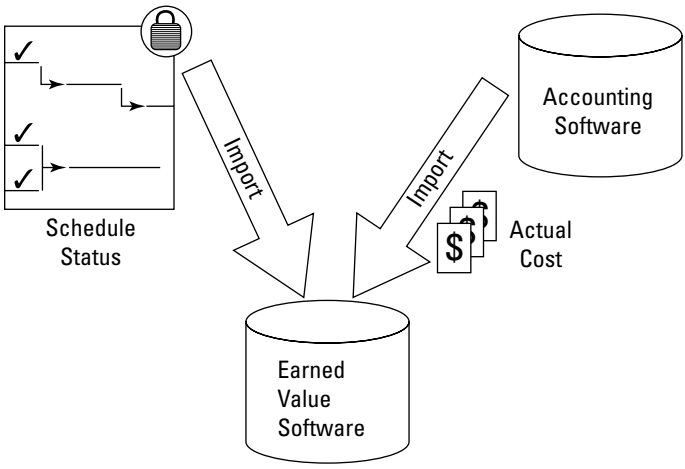

Figure 2-1: Importing status and cost data into earned value software.

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Alternative calculation methods

EVM guidelines provide several alternative methods for measuring the earned value of an activity in progress. These methods are often called *earned value techniques* or *performance measurement techniques*. Following are some of the most common alternative methods:

- **Discrete effort:** In this method, earned value is based on *discrete effort* — a measurable, tangible activity, such as pouring a foundation, constructing a shipping container, or writing an installation document.

  The Defense Contract Management Agency (DCMA) provides several methods for determining the earned value of discrete efforts at `www.dcma.mil`.

- **Level of effort (LOE):** This method, which bases earned value on passage of time, is used when a project has no definable discrete accomplishments. Examples of LOE are quality-control inspection and program management. Earned value is always equal to the amount budgeted.

Another component of status is the work remaining to complete the activity. The work remaining is also referred to as *Estimate to Complete (ETC)*. Project managers can choose whether to load the remaining resources in the schedule and integrate, or they can load the ETC in the earned value software.

Here are a few simple things to keep in mind about calculating earned value:

- If an activity is complete, the earned value is equal to the budget for that activity.
- If an activity hasn't started, it has no earned value.
- If an activity is in progress, it has earned value, which is typically budget multiplied by the percentage complete.

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Analyzing Variance

Variance analysis is the byproduct of looking at your earned value, schedule, and actual costs.

Understanding and calculating variances

Following are three types of variances, along with the methods of calculating them:

- **Cost variances** measure the difference between the task that was accomplished and how much was spent to complete that work.

  Cost variance = Earned value – Actual costs

- **Schedule variances** measure the amount by which a project runs above or below schedule.

  Schedule variance = Earned value – Planned value

- **At-complete variances** measure the project budget at completion against the forecasted cost at completion. These variances can be viewed as dollar or percentage variances or as current-period or cumulative variances.

  Variance at complete = Budget at complete – Forecasted cost at complete

Setting thresholds

Thresholds are set for variances that are out of tolerance to ensure that only meaningful variances are analyzed. You don't want to spend time analyzing all project variances, many of which are immaterial. They allow for management by exception. You can find problem areas quickly and effect change. You're most likely to use thresholds for external customer reporting, for example.

Many projects set tighter thresholds for internal reporting than for external customer reporting. This allows the project manager to keep a closer eye on performance and identify trends before they become a problem.

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Analyzing out-of-tolerance variances

After variances are calculated, out-of-tolerance variances are analyzed. Typically, a variance analysis document from the earned value software application defines the variances that fall outside the defined thresholds. A good variance-analysis document identifies the nature of the problem, lists significant reasons for the variance, and states corrective actions to be taken to reduce the effect of the variance on the project.

Several cost and schedule indices provide a quick view of where you are from a schedule and cost perspective. These indices include the Schedule Performance Index (SPI), which is calculated by dividing earned value by planned value, and the Cost Performance Index (CPI), which is calculated by dividing earned value by actual cost. If these indices are at 1.0 or higher, your project is in perfect shape; anything less than 1.0 indicates an issue. Tracking these indices is a great way to understand patterns in a project.

Using EVM for Project Monitoring and Control

One thing that makes EVM so valuable is its capability to identify trends that are different from your original plan. EVM can give a project or program team (or an entire enterprise) a much better picture of the health of a project and identify areas that need greater attention.

Using the variances, thresholds, and forecasting techniques identified in this section gives you visibility into the performance of your project, enabling management by exception and making it easy to identify and correct problems.

Identifying risks

Several risk areas and warning signs should be investigated and then explained, mitigated, or addressed in future planning to decrease performance problems, cost increases, and schedule slips. These risks include the following:

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- Cumulative cost or schedule variances, or projected variances at project completion
- Dramatic decreases in *management reserve,* which is money set aside for project contingencies
- *Scope creep,* or increases in areas that aren't related to contract changes

Managing the critical path

The *critical path* is the sequence of activities that must be completed on schedule for the entire project to be completed by a specified date; as a result, it's the longest path in the schedule. If an activity on the critical path is delayed by one day, for example, the entire project will be delayed by one day unless another activity can be accelerated by one day.

Also, when any technical aspect of the project proves to be more complex than anticipated, cost overruns and schedule slips commonly occur. Understanding the relationship among scope, cost, schedule, and risk is critical to successful project execution.

Obeying the Law of Projects

John Donne wrote "No man is an island." The Law of Projects paraphrases Donne by saying that no project component — scope, cost, schedule, or risk — is an island. Adjusting one aspect will almost certainly affect the others. When a project manager applies a corrective action to cut costs, for example, the work that can be completed is affected because the project team has less money to complete its tasks.

To attempt to recover lost time, the project manager can assign additional resources or reduce the scope of work. If he or she adds scope, for example, more time and money are required. Understanding the Law of Projects greatly enhances project planning and management.

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Forecasting final project costs

Adding the ETC (refer to "Collecting status information," earlier in this chapter) to the cumulative actual costs gives you the *estimate at complete* (EAC), which is the forecast of your final project cost.

Applying EVM to Specific Types of Projects

Earned value management can be used on any project, regardless of dollar value, duration, or contract type.

Project size and length don't determine whether EVM is appropriate. In any type of project, regardless of contract type, the project manager is required to track scope, schedule, and cost. Also, whether a project's duration is one month or five years, scope, schedule, and cost determine success. Whenever you're expected to complete certain work on time and within budget, you must budget and schedule project activities.

Cost-reimbursable projects

Many development projects are awarded as *cost-plus* or *cost-reimbursable,* meaning that all allowable project expenditures are reimbursed by the customer. By nature, cost-reimbursable projects tend to be risky due to the many unknown aspects of the scope of work. Thus, cost and schedule challenges are highly likely, and the projects must be managed closely.

EVM is an effective method for tracking development projects because the work is complicated and the scope must be carefully managed. The customer bears the brunt of risk on a cost-reimbursable project; projects of this type often require the use of EVM so that the customer knows the project is being managed in a methodical way.

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Fixed-price projects

Fixed-price projects have a fixed budget for the scope of work to be completed. A fixed-price project generally assigns the bulk of project risk (and opportunity) to the contractor. After the project's scope, schedule, and cost have been negotiated, the contractor is responsible only for reporting scope and schedule issues to the customer. Profit and loss are the business of the contractor alone; thus, customer cost reporting normally isn't required.

You can use EVM for fixed-price projects. As the risk shifts from the customer to contractors, the contractors must manage the project as effectively as possible to maximize profit, so many of them choose to use EVM.

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Chapter 3

Everyday EVM

In This Chapter

- Examining the life cycle of projects
- Looking at an example project

EVM isn't just for corporations and government contractors. It's for groups of all kinds and sizes that have projects to plan and that want to make their plans as efficient (and cost-effective) as possible.

In this chapter, we apply EVM to an everyday project. First, we take you through the project management life cycle; then we show you how to use EVM in every phase of this cycle for the example project.

Tracking the Project Life Cycle

All projects follow a common life cycle. The cycle consists of proposal, planning, execution, and closeout. In the following sections, we explore these components separately.

Proposal

The *proposal* phase is one of the most challenging phases of any project's life cycle. As soon as a contractor responds to a customer's request for proposal (RFP), the hard work begins.

The quality of a proposal makes a big difference in the competition for the contract. The following traits make for a good proposal:

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- Scope, cost, and schedule are clearly defined, along with the tasks that must be accomplished to complete the project.
- All stakeholders are included throughout the estimating process.
- Independent teams are established to review the estimate from scope, cost, and schedule perspectives.
- Estimates are related to past performance, which provides the basis for making additions and subtractions (trade-offs) in the scope, cost, and schedule. This creates what is typically called a basis of estimate (BOE).
- A Work Breakdown Structure (WBS) is created, and the bid is created around it. (For more on the WBS, see Chapter 1.)
- The statement of work (SOW; see Chapter 1) is created and tied directly to the WBS to ensure focus on project scope.
- The proposal plan should address risks and opportunities, because the risk/reward concept will be the foundation for decision making in the project's execution phase.

After the proposal has been negotiated and accepted by the customer, project planning begins. The proposal documents are the starting point for planning, so do a thorough job of putting them together. Make sure to keep track of any changes that occur during the negotiation process so that you understand impact on scope, cost, or schedule.

Planning

During the planning stage, the project team solidifies the following artifacts for execution:

- WBS
- WBS dictionaries outlining scope
- SOW
- Integrated master plan (IMP) defining the flow of work
- Integrated master schedule (IMS)
- Performance measurement baseline (PMB)

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- Management reserve for unknowns
- Risk/opportunity plan

The PMB is particularly important, because all cost and schedule data will be measured against it. It should include all the work to be performed and the people who will perform that work, as well as a well-defined time-phased budget and schedule. (We discuss time phasing in Chapter 1.)

For government contract projects that require EVM, the PMB becomes the basis of an audit known as an integrated baseline review (IBR). The IBR is a joint review by the government and the contractor that assesses whether the plan is realistic and can be implemented. This review is a learning and discovery activity for both parties.

Execution

When the plan is complete, work on the project (the *execution phase*) begins. The schedule provides the structure, specifying what work is to be done and when it must be done.

During the execution phase, the project manager has several responsibilities, including the following:

- **Tracking progress:** The project manager measures progress against the PMB to assess what's happening on the project, such as how much work should have been accomplished compared with how much work *has* been accomplished.
- **Analyzing variances:** The project manager examines cost and schedule variances to track deviations from the plan.
- **Estimating completion costs:** The project manager routinely estimates the cost of completing the remaining work.
- **Tracking changes:** Change management is a critical element of the execution phase, and the project manager must track all changes that happen during the project. Change management is very challenging, but it yields vital data that can help the plan evolve throughout the execution phase.

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Closeout

When the project is finished (the scope of the project has been delivered in technical terms), the *closeout* phase begins. Leftover project equipment is disposed of, and final project accounting is performed.

On government projects, contractors must follow certain guidelines and requirements for contract closeout.

Seeing EVM at Work in an Example Project

In this section, we apply EVM to a simple project: planning a party, which is something that you've probably done a time or two.

This example follows a standard project life cycle (see the preceding section) and involves all the elements of a project through the proposal, planning, execution, and closeout phases.

This example is a great one to use to illustrate EVM for project teams, friends, and family members. Many people use EVM every day and don't even realize it.

Proposing the project: Neighborhood barbecue

A group of neighbors decided that they wanted to have a barbecue for everyone on the street — both adults and children. Because of the weather, they decided that the party should be held at the end of October.

Step 1: Understanding what the customer wants (RFP)

The purpose and timing requirements (request for proposal) were the basis of a party plan. The group had to complete the proposal plan to present at the August neighborhood meeting, where there would be a vote to accept or reject the plan for the party.

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Step 2: Appointing the party committee (proposal team)

At the kickoff meeting, the neighbors chose a chairperson and a party committee to plan the event. (The project team held a proposal meeting and appointed a project manager and proposal team.)

Step 3: Estimating attendance by understanding the past (past performance)

The committee members estimated that most families would be willing to pay $10 for a night of entertainment. They knew from planning earlier events that 50 percent of families were likely to attend (of the 100 families in the neighborhood, 50 families would be likely to attend). This historical information provided the past-performance information needed to form the basis of estimates.

Step 4: Establishing the budget (tops down estimate)

Based on the committee's estimate that each family would be willing to spend $10, the budget was set at $500 (since they think 50 families will attend).

The committee decided that any money left over — what would be profit in a commercial project — would be used to buy tables for future neighborhood parties.

Planning the event

After the committee held its kickoff meeting, it began planning the party.

Step 5: Listing tasks and workers (WBS)

First, the planners (project team) established what jobs needed to be done and who would do them — which in EVM means building a work breakdown schedule (WBS). In addition, they aligned the work by product and established leaders (CAMs). Finally, they plotted the activities and the work teams in a table. Figure 3-1 shows the EVM equivalent of this table: a responsibility assignment matrix.

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WBS	Responsible	Project Teams			
1. Top Level Party	Project Manager	Food	Logistics	Games	Proj Mgmt
1.1. Food	CAM1	X			
1.2. Logistics	CAM2		X		
1.3. Games	CAM3			X	
1.4 Proj. Mgmt.	CAM4				X

X denotes Control Accounts

Figure 3-1: Aligning the party tasks and teams.

For a review of control accounts, as depicted in Figure 3-1, see Chapter 1.

Step 6: Planning the work (IMP/IMS)

Each responsible party and team now had to plan the work in a logical flow to deliver a barbecue to the neighborhood on schedule. Each team broke out its work and defined the activities required to deliver their product — in EVM terms, created the IMP and IMS.

The Food team, for example, decided to grill a whole pig, so it had to perform the following tasks:

1. Call vendors to get prices on the pig (known in the business world as a request for quote).
2. Inform the Logistics team that it needed to get a grill and enough gas to roast the pig — in EVM terms, perform a handoff.
3. Schedule people to get up early and watch that pig all day, as well as the equipment they need to make sure that the grill temperature is just right.

All teams planned their work (scope) in a similar fashion.

Step 7: Analyzing risk (risk plan)

In addition, the teams looked at the risks associated with their parts of the party. The most extreme risk with the lowest probability could have the greatest effect on the outcome of the event (the fun everyone had) and the cost.

The Logistics team, for example, came up with a contingency plan for weather: Members got estimates for renting a large tent to be used in case of rain on the day of the party.

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The tent was expensive, but making it part of the proposal plan ensured that the party would be held regardless of the weather.

The team's analysis formed a *risk plan.* If risk isn't accounted and planned for, it can cause cost overruns. In this example, the team members wouldn't be able to use the profits as they planned (to buy tables for future neighborhood parties). Worse, they'd have to pay the difference out of their own pockets.

At this point, the teams had accomplished the following tasks:

- They knew what they were going to do and when they needed to do it.
- They understood the hand-offs of tasks between the teams.
- They negotiated the dates and agreed on a time-phased IMS.
- They incorporated risk items into the plan.

Step 8: Creating the final cost estimate

With the plan complete, the teams assigned time-phased resources and budgets to the activities. Figure 3-2 shows the cost breakdown.

WBS	Responsible	Project Teams – Budget			
1. Top Level Party	Project Manager	Food	Logistics	Games	Proj Mgmt
1.1. Food	CAM1	$ 150			
1.2. Logistics	CAM2		$ 100		
1.3. Games	CAM3			$ 40	
1.4 Proj. Mgmt.	CAM4				$ 10
		Total Budget			$ 300

$500 Collections
– $300 Budget
= $200 Table Money

Time Phased Budget

WBS	Responsible	Aug	Sept	Oct	Total
1.1. Food	CAM1		$ 50	$ 100	$ 150
1.2. Logistics	CAM2	$ 10	$ 50	$ 40	$ 100
1.3. Games	CAM3	$ 10	$ 10	$ 20	$ 40
1.4 Proj. Mgmt.	CAM4	$ 5		$ 5	$ 10
	Total Budget	$ 25	$ 110	$ 165	$ 300

Figure 3-2: Breaking down the cost estimate by the project team.

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The amount of money that the group plans to collect versus the estimated cost is:

$500 (collections) – $300 (estimated costs) = $200 (profit)

The profit — in this case, money to be used to purchase tables — is in place, and the project manager can use the budget at his discretion as long he understands that any changes will cut into profit.

Also, the committee members can't forget that they may need a tent. They assess the probability of rain during that time of year to be about 20 percent. The Logistics team has found that renting a tent will cost $200. If it rains on party day and the team needs to rent the tent, the team will not be able to buy the tables.

The Games team decides that there must be opportunities to lower the total cost of the activities by $10 if it rains. They will replace one of their games that needs supplies with one that requires no special purchases.

Step 9: Presenting the proposal for approval

The project manager takes the lead in presenting the plan at the neighborhood meeting. He explains the scope, cost, and schedule. He gets everyone excited about the party, and the plan is accepted.

Executing the plan

Now the team begins to execute its baseline plan.

Step 10: Scheduling regular status meetings (business cadence)

The event is nine weeks away, and the committee members decide to meet once a week to talk about where they are in cost, status, and scope. In other words, they define their *business cadence* (which can also be thought of as a project calendar of events). Getting together to talk about what's happening and address any issues is important to the success of the overall project.

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Step 11: Tracking activities (status)

During the first two weeks, all the plans are moving along as predicted. The teams are on budget and schedule. They are updating project status, which will result in earned value (discussed in Chapter 2).

Step 12: Adjusting for reality (estimate to complete)

In Week 3, the Food team is thrown a curveball: There has been an increase in the price of pork. The original food budget was $150 (refer to Figure 3-2), and with this increase, the new estimate is $200. Now the entire group must assess the project scope, their actual expenditures, and what they need to spend in the upcoming weeks — in EVM terms, deriving a new *estimate to complete.*

The logistics team communicated with their vendors and in doing so realized that the price of propane for the gas tanks had gone down slightly. Incorporating both the meat-price increase and the propane-price decrease, the team arrived at a new estimate of $310. The new estimate was $10 more than the initial $300 budget — in EVM terms, a $10 *variance at complete.* In coming up with this estimate, the team also decided to use some of the opportunities that were planned for in the proposal phase. Good thing that the team looked closely at risks and opportunities. Figure 3-3 shows the updated estimates.

Step 13: Managing the schedule (schedule variance)

The team meetings continue, and in Week 6, another issue arises. The Games team reports that it's behind schedule in planning children's activities — in EVM terms, *reporting a schedule variance and a declining schedule performance index.* The team is late (not able to show all earned progress) on the wooden boxes for the beanbag toss game, because the person assigned to make them has been ill (see Figure 3-4).

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WBS	Responsible	Project Teams – EAC			
1. Top Level Party	Project Manager	Food	Logistics	Games	Proj Mgmt
1.1. Food	CAM1	$ 200			
1.2. Logistics	CAM2		$ 60		
1.3. Games	CAM3			$ 40	
1.4 Proj. Mgmt.	CAM4				$ 10
			TotalEAC		$ 310

Time Phased EAC

WBS	Responsible	Aug	Sept	Oct	Total
1.1. Food	CAM1		$ 50	$ 150	$ 200
1.2. Logistics	CAM2	$ 10	$ 10	$ 40	$ 60
1.3. Activities	CAM3	$ 10	$ 10	$ 20	$ 40
1.4 Proj. Mgmt.	CAM4	$ 5		$ 5	$ 10
	Total Estimated	$ 25	$ 70	$ 215	$ 310

Denotes a Change

300 Budget At Complete
– 310 Estimate At Complete
= (–10) Variance At Complete

Figure 3-3: Updating the estimated to complete.

Games Team	Aug	Sep
Planned	$10	$10
Earned	$10	$8
Actuals	$10	$10
Cost Variance	$ –	$(2)
Schedule Variance	$ –	$(2)
SPI	1.0	0.80
CPI	1.0	0.80

Earned – Planned = Schedule Variance
Earned – Actuals = Cost Variance
SPI = Earned/Planned
CPI = Earned/Actuals

Figure 3-4: Understanding the variances.

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The team offers the project manager three options:

- Buy premade boxes.
- Get another craftsman to make the boxes.
- Substitute another activity for the beanbag toss game.

The project manager is the leader, and the team is looking to him for direction. He decides that the beanbag toss should be replaced by a simpler activity: a game of Red Rover. In EVM terms, the project team created a *change request,* which the project manager approved.

Step 14: Throwing the party (execution)

The party day has arrived. All the planning has the teams prepared to execute for the day. Everything is on schedule. The meat and the equipment arrived on time, and the pig went on the grill at exactly the right time to be ready to eat at 7 p.m. The roasters have worked out a schedule for the day, making sure that someone will always be able to watch the temperature of the pig. The atmosphere is happy and excited.

Step 15: Responding to changes (contingency plan)

Early in the afternoon, clouds were increasing, and rain looked imminent. The project manager held an emergency team meeting to discuss renting a tent, and at 3 p.m., he called the tent company, asking it to deliver a tent by 5 p.m. He understood that because he was using the profit and tradeoffs were limited at this stage of the project, the team wouldn't be able to buy the neighborhood tables.

The tent arrived two hours later, and the Logistics team moved all the equipment under it. The decision to rent the tent was a good one, as rain began falling shortly thereafter.

The rain stopped soon after the party began, however, and all the activities were held as scheduled. Execution was flawless. The collections projections were right on the mark, and exactly $500 was collected. The Logistics team cleaned up the site. Everyone had a great time, and the party was a huge success.

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Closing out the project

The team met the day after the party to close out the project.

Step 16: Finalizing accounts (reconciliation)

At the last meeting, the team members were prepared to make a final accounting. Members arrived with any receipts for expenses that they needed to be reimbursed for. All the vendors were paid, and all reimbursements were made. Figure 3-5 shows the final accounting.

WBS	Responsible	Project Teams – Final Close Out			
1. Top Level Party	Project Manager	Aug	Sep	Oct	Total
1.1. Food	CAM1		$ 50	$ 150	$ 200
1.2. Logistics	CAM2	$ 10	$ 10	$ 240	$ 260
1.3. Games	CAM3	$ 10	$ 10	$ 10	$ 30
1.4 Proj. Mgmt.	CAM4	$ 5		$ 5	$ 10
	Final Cost	$ 25	$ 70	$ 405	$ 500

Figure 3-5: Settling accounts at project's end – final cost by Control Account.

In the final accounting, the team had no profit. Great planning and weighing options during the proposal phase and throughout the execution phase allowed the team to make quick decisions and bring the project home on cost and schedule. They weren't able to buy the tables as they'd planned, but they didn't have to pay anything out of their pockets.

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Chapter 4

Introducing EVMS

In This Chapter

- Seeing the differences between EVM and EVMS
- Understanding EIA-748
- Breaking down the components of EVMS
- Understanding when a project calls for EVMS

EVM is a framework for managing projects. But what is an earned value management system (EVMS)? It's not a software tool or a training class; it's not even a three-ring binder containing your organization's standard operating procedures.

An *earned value management system* is an integrated set of processes, practices, and applications that state how your company is going to practice the discipline of EVM in compliance with the EIA-748 criteria (see the next section). The EVMS is a documented set of policies, practices, and disciplines.

If you're conducting your first EVM project and have to comply with federal regulations, we strongly suggest that you consider using an external consultant. A consultant's expertise can help you avoid making common mistakes.

What Is EIA-748?

In 1999, the U.S. government granted responsibility for defining EVM to contractors, subject only to the 32-item EIA-748 criteria. Except for a few minor adjustments and clarifications, the ANSI standard widely defines EVM today.

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Finding the EIA-748 standard

If your organization serves the U.S. government, it must document how its EVMS maps to the EIA-748 standard. Go to `www.ansi.org` and search for *EIA-748 standard* to find information about purchasing a copy of the standard for a nominal fee. When you're armed with the EIA-748 standard, you write a system description, which will be used to certify that your organization has met all 32 criteria in the EIA-748 standard. The Defense Contract Management Agency (DCMA) will audit and certify your system.

EVMS concepts are incorporated into a process guide defined in the Electronic Industries Alliance (EIA)-748 Guidelines on Earned Value Management. The EIA-748 process can be summarized as follows:

- **Scope definition:** Defining the project's scope consists of creating the statement of work (SOW) and the work breakdown structure (WBS). The SOW identifies the scope requirements for a project and is used as a basis for the schedule and budget. The WBS breaks the work down into definable product elements and is used to roll up cost and work.
- **Program organization:** During this phase, control points are defined to establish where actual costs will be collected and variances will be analyzed. A control account manager (CAM) is assigned to manage each unit of work. Also during program organization, a schedule is created, and budgets are assigned to individual tasks.
- **Performance measurement:** In the performance-measurement stage, status is assigned to short, discrete tasks in the schedule, and earned value is calculated (see Chapter 2.) Also, variances from the budget are analyzed, and corrective actions are considered.
- **Estimate at Completion costs:** As the project progresses, the remaining project costs are continually evaluated and updated. Project performance to date is used to analyze forecasted costs.

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- **Revision control:** As changes to the project occur, the schedule, budget, and forecast are updated to reflect the current scope.
- **Process documentation:** Finally, project management documentation is created that describes how each of these steps will be implemented across the enterprise.

Seeing What Makes up an EVMS

A standard EVMS is built on three foundations: people, processes, and tools. Implementing an EVMS will most probably change your internal processes and provide more structure for your team. Because using an EVMS can be different than how things are done today, people must consider the EVMS to be an organizational initiative and give it the kind of support that any change deserves.

People

A typical project team consists of a project manager, functional managers, CAMs, cost analysts, and planners. Having the right people on your project team — people whose skill sets, backgrounds, and expertise align with the project's goals and needs — is critical to success.

An inexperienced project team can be a recipe for trouble. If your first EVM project is the first time you've ever documented a project schedule, you may be trying to take on too much. Make sure that your team members understand the core skills of scheduling and managing costs before you take on EVM projects.

Processes

A project's earned value processes are the yardsticks that measure the performance of the project. Take the time to write down your project procedures, and you'll be way ahead, because the success of your EVMS will be evaluated based on the processes and procedures you have in place.

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Tools

The technical tools you use — for scheduling, accounting, communication, and so on — can make your journey much smoother. You need to research appropriate tools for your project. The right tools can handle the amount of data you need, grow with your project, and provide the necessary features and functions. They also improve reporting, automate many process steps, and increase operational efficiency.

Tools are only enablers for your process. Implementing great tools without also implementing a rigorous process can lead to disappointment, as though you bought a new car for someone but didn't give him driving lessons.

Knowing When a Project Requires EVMS

If your customer is the U.S. Department of Defense (DoD) or the National Aeronautics and Space Administration (NASA), and if your contract exceeds $100 million, your EVMS must go through a certification or validation process to make sure it fully complies with the EIA-748 standard. The process involves a robust evaluation of the management system to ensure that it supports the characteristics expected in a good EVMS relative to the 32 EIA-748 criteria. The process also evaluates typical documents that support these characteristics.

The validation process is conducted by the Defense Contract Management Agency (DCMA). You can find lots of great information on the web about the validation process. See the web references in the back of this book.

If your customer is the U.S. Department of Defense or the National Aeronautics and Space Administration (NASA) and if your contract is between $20 million and $100 million, you must have a compliant EVMS, but validation isn't required. In some instances, your customer may require EVM on a project because the project is high risk.

Table 4-1 shows the thresholds for EVM and the EVMS requirements for the different government agencies.

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Table 4-1 EVM and EVMS Thresholds for Various Agencies

Agency	*Thresholds*	*EVM Requirements*
Defense/NASA	Greater than or equal to $20 million	Required on cost or incentive contracts
	Greater than or equal to $100 million	Validation required on cost or incentive contracts
Energy	Greater than or equal to $20 million	Compliance required
	Greater than $50 million	Validation required
FAA	Greater than or equal to $10 million	All contracts
Health and Human Services	Greater than or equal to $10 million	Compliance required
	Greater than or equal to $25 million	Validation required
Homeland Security	Greater than or equal to $5 million, but less than $20 million	Discretionary
	Greater than or equal to $20 million	Compliance required
	Greater than or equal to $50 million	Validation required

Integrated baseline review

An integrated baseline review (IBR) is required for projects that exceed the EVM thresholds. An IBR is intended to verify the technical content and realism of the related performance budgets, resources, and schedules. It should provide a mutual understanding of the inherent risks in the contractor's performance plan and the underlying management control system, and it should formulate a plan for handling risks.

When the IBR is complete, the customer and contractor should have a mutual understanding of the PMB, risk, and

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opportunities. They should also have a plan to handle them, and should have captured all action items.

For more information on IBRs, check out the NDIA website and read the Integrated Baseline Review (IBR) Guide. It explains the process and purpose of an IBR.

Joint surveillance

In a joint surveillance, the contractor and DCMA review EVMS data jointly. These reviews are conducted periodically to ensure that the contractor is following its EVMS documentation in the execution of the project, and involve interviews with the CAM and the program manager.

If you see Defense Federal Acquisition Regulation Supplement (DFARS) clause 252.234-7002 in your SOW, EVMS and surveillance will be required on your contract. Be mindful of this during the proposal stage of your project.

Required reports

A customer has standards for how it wants to see your EVMS reported, and those standards are typically depicted in a data item description (DID). A DID outlines the appearance and content of the report. An example of a DID description is DI-MGMT-81861 Integrated Program Management Report, which describes the required reports. For NASA projects, NPR 9501.2E outlines a 533 report.

Other reports are based on derivatives of EVMS data, including contract funds status reports and 1921 reports. DIDs outline the structure and content of these reports.

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Chapter 5

Better Project Management through Technology

In This Chapter

- Using technology to enhance EVM
- Choosing different tools for different disciplines

Managing tasks and tracking costs manually is a cumbersome, error-prone process. Fortunately, many disciplines in project management can be improved through the use of technology. An entire industry makes commercial off-the-shelf (COTS) solutions for project professionals to take the guesswork out of managing scope, schedule, and cost.

Three categories of applications provide you all the tools you need for EVM project management:

- Planning and scheduling
- Earned value software
- Analytics

In this chapter, we discuss all three types of applications.

Planning and Scheduling Software

To manage earned value effectively, you need to start with a planning and scheduling application. Software packages such as Microsoft Project Professional, Deltek Open Plan, and

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Oracle's Primavera offer the capabilities you need to manage the plan.

When you look for planning and scheduling software to use in EVM project management, look for an application that lets you do the following things:

- Enter activities with durations
- Define relationships among activities
- Calculate the critical path of a project
- Define multiple types of relationships (finish to start, start to start, and so on)
- Organize activities by a work breakdown structure (WBS)
- Support multiple synchronous users
- Integrate with cost-management or EVM applications
- Support cross-project relationships and resource availability
- Assign resources (material, equipment, or people) to tasks

If your organization works on projects for the U.S. Department of Defense, the software should also allow you to conduct a 14-point schedule assessment — necessary for defense projects.

Earned Value Software

Earned value software applications give you the ability to manage a time-phased budget, actual costs, and time-phased forecasts, and perform earned value calculations.

COTS earned value solutions are available, such as Deltek Cobra. Cobra integrates with popular planning and scheduling applications (to obtain schedule data) and integrates with accounting systems (to obtain actual cost data).

An earned value software solution should allow you to perform the following tasks:

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- Load budget data from your planning and scheduling applications
- Automatically load actual cost data from most accounting systems
- Calculate earned value using all approved methods
- Create detailed time-phased reports or high-level, multiple-project reports

  Many organizations manage more than just one project. This is an important consideration when selecting the right cost management application. Look for software that supports multiple projects and multiple resource rate decks.
- Submit standard monthly reports in many formats, including IPMR 1–7, CPR 1–5, C/SSR, CFSR, 1921-1, 553M, and 533Q

For U.S. government projects, the software should be able to export data using the latest UN/CEFACT XML standard.

Now you have the basics of a cost management software application in place. Congratulations!

Analytics/Intelligence Software

To take your earned value and scheduling software to the next level and streamline your process, you may want to add an earned value (EV) analytics or business intelligence application to the mix. Deltek wInsight Analytics is the premier earned value analytics engine on the market today. This tool utilizes the associative model, allowing for individual data discovery, and is fully mobile. An EV analytics solution summarizes detailed EV performance information graphically so that program managers and executives can identify the causes of a problem easily.

Your customer can use an EV analytics application to measure your performance on a monthly basis. If you have this tool, you then have the ability to analyze the program's performance exactly as your customer would.

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EV analytics solutions have a long history of helping project management professionals with common key performance indicators (KPIs) that measure project health.

Deltek wInsight Analytics is a widely accepted software application that federal and state agencies and industries use to integrate earned value into their management processes. From the team leader's desktop to the corporate boardroom, from the program office to the Pentagon, wInsight is a good choice for measuring contractor performance.

To get a proactive view of project performance and see what your customer is seeing, make sure the software you choose is a widely accepted product that supports key performance metrics (DCMA Trip Wire Metrics, Independent Estimate at Complete analysis, trend analysis, and so on).

Risk Management Software

Remember that managing your project is all about managing scope, schedule, and cost. Keep in mind that project risk can impact any one of those at any time. *Risk management* is a project management discipline that seeks to minimize or account for project risk and opportunities. Although project risk can't be eliminated, actions can be taken to minimize their impact to the project. (Risk management is a topic worthy of its own book but it is important enough to touch on here.)

More organizations are realizing the benefits of taking an active approach to risk management by implementing a software system across major projects and throughout the whole organization. This approach can help with:

- Better informed planning and decision making
- Identification and effective exploitation of opportunities
- More business won and profitability delivered
- Reduced insurance premiums through the proof of effective risk management
- Enhanced credit ratings and reduced cost of borrowing
- The ability to identify emerging risks

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Deltek's Acumen Risk is a leader in risk management, handling both qualitative and quantitative risk analyis.

Look for enterprise risk management software to improve project profitability and reduce unwanted surprises. Look for software that allows executives, project professionals, and subcontractors to make informed decisions by centralizing risk and opportunities related to technical scope, schedule, and cost.

Integrated Program Management Software

In many cases the person responsible for managing the scheduling software and earned value software is reluctant to allow project team members access to their software. What they fear is that others will mess up the integrity of the data.

What is a project to do when you may have hundreds of people that you need to collect statuses from? You need a better way. You need a way for the team to view information and enter status without affecting the source system.

Integrated program management seeks to help you with this. What these applications do is quite remarkable. They incorporate new innovations in business process management automation, role-based portals, subscription-based email alerts, and customizable forms.

The first COTS-integrated program management software that combines these capabilities is Deltek PM Compass. Deltek PM Compass is a business process automation solution built specifically for project management professionals. This application streamlines the program management process by integrating scope, schedule, and cost information through a customizable workflow and alerting engine. It will help deliver more consistent and reliable performance so that you can stay focused on customer success.

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Chapter 6

Demystifying EVM

In This Chapter

- Understanding that using EVM is easier than you may think
- Realizing that EVM can and should be used in many situations

EVM means different things to different people, but the two most common emotions that it inspires are fear and apathy. Some people fear that EVM is hard and time-consuming, that it adds too little value and is too expensive. Others are apathetic, thinking that they don't need EVM to manage their businesses or to win contracts.

In this chapter, we examine and demystify six common myths about EVM.

Myth 1: EVM Is Hard

EVM has earned a reputation of being a rigorous process and rightfully so. Where most people struggle with EVM is when they don't invest enough energy in the upfront planning. People have found that EVM isn't hard when the plan reflects reality. In fact, following the process is fairly straightforward. It can offer the project team the right information at the right time.

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If you didn't use EVM, you still need to manage project scope, schedule, and cost — which exist in every type of project — and you still need to collaborate and communicate. Project management is tough, but EVM gives you a rule book that makes the job easier.

Myth 2: EVM Is Expensive

Initially, EVM adds cost. But using EVM is like buying project insurance. Executed correctly, EVM gives you realistic feedback and quality management information, and it helps you make more informed decisions. The question you should ask yourself is this: "Can my project afford *not* to manage scope, schedule, and cost?"

If you implement EVM in a constructive manner, it will pay back the initial investment in dollars, time, accuracy in reporting, and good reputation over the life of this project and for many others you're sure to win in the future. *Clarity Focus on Program Management,* a yearly report that Deltek undertakes to report on trends in program management, indicates that companies that use EVM have higher schedule and budget adherences and higher profit margins.

Cost/Schedule Control Systems Criteria

This earliest formal system, called the Cost/Schedule Control Systems Criteria, was neither simple nor cheap. Although it proved to be a valuable tool for early detection of cost and schedule performance issues, it also was burdensome, rigid, and inappropriately implemented. As a result, companies rarely adopted EVM voluntarily due to the perception that the process was valuable only to the government.

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Myth 3: EVM Looks Backward

EVM definitely tells project teams where they've been, so many people don't recognize the value of the forward-looking metrics that EVM processes can provide.

Statistical estimates can predict the final cost of your project. These statistical calculations have proven to be reliable indicators of the final cost of a project (cost at complete).

In fact, statistics show that once a project is 15 percent complete, program performance doesn't significantly improve during the period between 15 and 85 percent. In other words, you can usually make a pretty good forecast of where a project is going based on where it's already been — making historical information a good indicator of final performance.

There are also metrics that measure how much work there is left to do and how much money is left to spend. These metrics tell you whether your forecasts are consistent with the work you still have to do on the contract.

Two different ways to use past/current performance to estimate the future include:

- IEAC (Independent Estimates At Complete) use Cumulative indices for both schedule and cost to statistically predict final contract outcomes.
- TCPI (To Complete Performance Indices) for both forecast and budget indicate whether there is enough money to complete the work left on the contract. These indices should be a part of the monthly analysis, and CAMs and IPT leads should be required to understand the metric.

Myth 4: EVM Is Only for U.S. Government Projects Valued at over $20 Million

Companies in multiple industries find EVM principles and guidelines useful even in projects that don't require it based

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on the government mandate. The *Clarity Focus on Program Management* states that in the aerospace and defense market segment, 43 percent of projects were being managed with EVM principles, yet only 27 percent had EVM requirements. The report also stated that aerospace and defense firms reported the lowest internal threshold at $6.1 million for use of EVM on the project. The government mandate is for any project greater than $20 million, so this survey shows that companies recognize the value of EVM and use it even when they don't have to.

Many companies use EVM on all revenue-generating projects as well as internal projects. EVM offers benefits such as enterprise resource planning, multi-project schedules, and process consistency.

Myth 5: Only Very Large Government Contractors Use EVM

Yes, in the past large government contractors were the largest users of EVM. But the need for transparency and accountability to help deliver projects on time and on cost has driven firms of all sizes to make EVM a part of their culture. In fact, the *Clarity Focus on Program Management* states that companies with up to 100 employees were using EVM on their projects 45 percent of the time. This is an impressive number, demonstrating that projects and companies of any size can benefit from EVM.

Myth 6: Only Aerospace and Defense Firms Use EVM

Yes, EVM originated in aerospace and defense. However EVM is an efficient and productive way to manage any project. According to the *Clarity Focus on Program Management,* aerospace and defense companies are the most frequent users of EVM (43 percent), but consulting is a close second with 41 percent. The construction industry ranks third, with 22 percent of their projects using EVM. These percentages show that EVM isn't only for A&D companies.

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Chapter 7

Seven Ways to Succeed with EVM

In This Chapter

- Getting buy-in
- Managing projects effectively

EVM may sound like a great idea, but maybe you and your team members don't quite know where to start. This chapter gives you some pointers on how to get the process started.

Go for It!

Implementing EVM in an organization can truly improve project performance. Meeting budgetary and schedule expectations remain two of the most critical success factors for project-based companies. So hand out copies of this book to your co-workers and get them on board with the EVM program.

Get Organizational Buy-In

Before you begin using EVM (which means managing with metrics, indices, or price/usage variances), folks at your organization need to understand what the information means to them, how that information is beneficial to program management, and what corrective actions must happen. Executive management must understand the data to assist in managing the business and ensure that program managers are using EVM effectively.

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So how do you implement change and buy-in?

- **Share reasons for change.** There must be a reason for the change for example, increasing program performance.
- **Include team members.** Develop a team-based environment with open communication, shared information, inclusion, and lessons learned.
- **Provide training.** Without the knowledge of the reasons for change, the employees won't buy into the process.
- **Listen to concerns.** Everyone must feel like they can express concerns and fears.
- **Incentivize.** This includes promotions, monetary rewards, expanded roles, opportunities, and flexibility.

A study commissioned by Arthur D. Little states that "profit and external competition continue to drive a majority of corporate change initiatives." Yet, two-thirds of the executives surveyed cited a lack of buy-in among their managers and employees as the most significant barrier to change.

Define Project Management Processes

Defining the processes and procedures are keys to successful EVM implementation. Consistency across the EVM processes is essential and allows decision makers to respond quickly while maintaining consistency. The business processes should be written so that a certain level of consistency is maintained, regardless of software or hardware used.

Instill the Processes into the Culture

When EVM is used as a management tool, not simply a reporting tool, the value is proven. In the *Clarity Focus on Program Management* report, firms of all sizes reported using EVM

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well beyond what is contractually required. This is especially true in the construction and engineering industry, where the reported usage of EVM exceeded the required usage by over four times.

When you explain EVM metrics and program performance to upper management, use the data in a constructive, positive manner. Use data to assess the impact to the program, understand the risks involved, and determine corrective actions, not to paint a negative picture of other processes or departments. Being positive tends to increase buy-in.

Maintain a Consistent Business Cadence

Cadence is a rhythm that brings program management and execution together. This rhythm keeps everyone in the organization or the program synchronized and executing at an ideal pace.

Establish the business or program cadence at the beginning of the program. Make sure that the customer, subcontractors, and program personnel all agree. The cadence can be a weekly, monthly, or quarterly schedule that is developed to maintain consistency with all program participants. This ensures that everyone knows their roles, responsibilities, and due dates. With the program team in sync, the EVM process works smoothly and efficiently.

Practice Rigorous Risk/Reward Management

Have you ever had that feeling that everything is going okay, but you just *know* that there is something out there just around the corner that may jump out and bite you? Well, that is the whole basis for performing risk management on a project. Risk management deals with those "known unknowns." Risk management is tightly integrated with EVM in three areas:

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- Management Reserve
- Risk handling
- Risk contingencies

Management Reserve (MR) is established to cover "unknown unknowns" and "known unknowns" (risks). When risks are identified, risk handling plans are developed and, if approved, become part of the PMB. Where does the money come from? Management Reserve! The same thing happens when a risk is realized. The money comes from MR and the contingency plan is incorporated into the PMB, or the cost is forecast in the EAC.

By having the risk management process tightly integrated with EVM, the risk manager can monitor the risk status, actual cost, and projected cost as well as the impact of the risk on the overall project schedule critical path and milestones. Honestly, what project manager wouldn't want that!

Facilitating EVM in Your Organization

After you choose EVM as a project management process, you need to determine how your organization as a whole will adopt that process. In this section, we discuss the main tasks involved in introducing EVM throughout an enterprise.

Consultants can help with every facet of setting up your EVM process to include establishing an EVMS, writing a system description, organizational effectiveness, and training. Investigate getting help; it will save money in the long run.

Identify a focal point

Identifying a person that oversees the implementation and use of EVM helps ensure that the system complies with both customer and internal requirements. This person, known

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as a *focal point,* is responsible for the coordination of the people, processes, and tools related to EVM. By providing skilled personnel who oversee the implementation of EVM and either help with or assume project oversight, you can ensure that your organization's EVM process is consistent and effective.

EVM compliance certainly evolves over time to fulfill project goals more effectively. The EVM focal-point concept ensures that this evolution occurs across the organization consistently.

Establish a center of excellence

Many organizations have implemented an earned value center of excellence (EV COE). A center of excellence performs the same duties as a focal point (see the preceding section) but is centralized within the organization to facilitate a more consistent approach to EVM. One distinct advantage of a center of excellence is its capability to standardize reporting, including reports used for internal project reviews.

Set up a project management office

A project management office (PMO) expands on the concept of the center of excellence (see the preceding section) to encompass the entire project management function.

The PMO focuses on project management best practices (including cost and schedule controls), such as EVM. An effective PMO integrates processes to eliminate duplication of effort, ensure compliance with contractual and internal requirements, evaluate and refine processes, and train personnel to use the tools and methods required for successful project execution (see the next section). In some organizations, the PMO is also responsible for overall project execution and for providing status reports to the customer and internal management.

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Train the project management team

Training should focus not only on specific processes, but also on how each process addresses project management objectives. Earlier in this chapter, we mention that scope, cost, schedule, and risk are the project manager's main areas of focus. Linking EVM techniques to one or more of these areas facilitates acceptance within the program management organization. Train the team to know that EVM is part of the management effort they are already doing and that it isn't additional work. They're already managing these vital areas of the project.

A comprehensive EVM training program should include the following topics:

- Project management fundamentals
- Project scheduling
- Internal cost collection systems
- Government EVM regulations

EVM training should fully comply with the EIA-748 criteria. Similarly, organizational policies and procedures should align with the EVMS. Senior management, executives, and other organizations, such as finance and engineering, demonstrate objective proof that the EVM concepts and intent have been fully adopted.

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Appendix A

Formulas

This appendix covers the most important formulas for calculating EVM.

Acronyms

- **AC:** Actual Cost
- **EV:** Earned Value
- **PV:** Planned Value

Formulas

- **Cost Variance (CV):** CV = EV – AC
- **Cost Variance % (CV %):** CV% = 100 x (CV/EV)
- **Schedule Variance (SV):** SV = EV – PV
- **Schedule Variance % (SV %):** SV% = 100 x (SV/PV)
- **Cost Performance Index (CPI):** CPI = EV/AC
- **Schedule Performance Index (SPI):** SPI = EV/PV
- **To Complete Performance Index (TCPI):** TCPI EAC = Work Remaining / Cost Remaining
  TCPI EAC: = (BAC – EV)/(EAC – AC)
- **% Complete:** % Complete = 100 x (EV cumulative/BAC)
- **% Spent:** % Spent = 100 x (AC cumulative/BAC (or EAC))
- **Variance at Complete (VAC):** VAC = BAC – EAC
- **Variance at Complete % (VAC %):** VAC % = 100 x (VAC/BAC)

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- **Independent Estimate at Complete (IEAC):** IEAC calculations are based on the use of a Performance Index:
  - IEAC = AC cumulative + (BAC – EV cumulative)/ Performance Index
  - IEAC = AC + (BAC – EV) / CPI
  - IEAC = AC + (BAC – EV) / SPI
  - IEAC = AC + (BAC – EV) / (SPI * CPI)
  - IEAC = AC + (BAC – EV) / ((SPI * .20) + (CPI * .80))
  - IEAC = AC + (BAC – EV) / CPI_x (x equals the cumulative of the last x periods)

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Appendix B

Glossary

actual cost: The sum of costs actually incurred in accomplishing the work performed. Sometimes referred to as actual cost of work performed (ACWP or AC).

baseline change request: Method of requesting a change.

budget at complete: The total planned value or BCWS at the end of the project.

budgeted cost for work performed (BCWP): *See* earned value.

budgeted cost for work scheduled (BCWS): *See* planned value.

control account manager (CAM): A member of the organization responsible for control account performance, and for the management of resources to accomplish such tasks.

cost performance index (CPI): Ratio of work accomplished versus work cost incurred for a specified time period. The CPI is an efficiency rating for work accomplished for resources expended.

cost variance (CV): The difference between the earned value and the actual cost.

data item description (DID): Data item description contains the format and content preparation instructions for the data product generated by the specific and discrete task requirements as delineated in the contract.

earned value (EV): EV quantifies the amount or volume of work completed to date, and is commonly known as the

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budgeted cost of work performed (BCWP). When compared to the planned value (budgeted cost of work scheduled) and its actual cost (actual cost of work performed), EV provides an objective measure of schedule and cost performance.

earned value management system (EVMS): EVMS is the integrated set of processes, applications, and practices that follow the guidelines in the EIA Standard 748. The guidelines describe the attributes of an effectively integrated cost, schedule, and technical performance management system.

earned value techniques: Techniques used to record performance for work accomplished within a work package, which must be consistent with those utilized in the planning of the work.

estimate at complete (EAC): A value expressed in either dollars and/or hours, to represent the projected final costs of work when completed. The EAC is calculated as ACWP + ETC.

estimate to complete (ETC): The value expressed in either dollars or hours developed to represent the cost of the work required to complete a task.

integrated baseline review (IBR): An IBR is intended to verify the technical content and realism of the related performance budgets, resources, and schedules. It should provide a mutual understanding of the inherent risks in the offerers'/contractors' performance plans and the underlying management control systems, and it should formulate a plan to handle these risks.

integrated master plan (IMP): An event-based, top-level plan that consists of a hierarchy of events that are supported by specific accomplishments, and each accomplishment associated with specific criteria that must happen in order to claim completion.

integrated master schedule (IMS): The IMS is developed so that tasks and milestones are clearly defined. It is updated regularly to identify elements that are behind as well as those ahead of schedule.

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integrated product team: An organizational structure established for program performance that diverges from the functional organization. This team has the shared responsibility to produce a specific product or service.

integrated program management report (IPMR): The IPMR presents the cost and schedule data for the current period as well as in a cumulative format. The IPMR replaces the CPR for new contracts in late 2012. The IPMR consists of seven formats.

management reserve (MR): A portion of the contract budget base that is held for management control purposes by the contractor to cover the expense of unanticipated program requirements. It isn't a part of the performance measurement baseline. Another term for management reserve is contingency.

organizational breakdown structure (OBS): A hierarchical structure designed to pinpoint the area of functional responsibility.

planned value (PV): The assignment of the budget for each reporting period for each work component. Also called BCWS.

planning package: Similar to work packages in that they contain a time-phased budget, but only have a broad general work description. It is future work that can't be planned in detail. When sufficient detail is available, these planning packages are detail-planned into work packages either in part or as a whole. The sum of the work packages and planning packages within a control account must at all times be equal to the value of the control account.

performance measurement baseline (PMB): The time-phased budget plan against which the contract performance is measured. It is the sum of all control account time-phased budgets plus any undistributed budget not assigned to a scheduled control account.

responsibility assignment matrix (RAM): The RAM correlates the work required by a work breakdown structure (WBS) element to the functional organization responsible for accomplishing the assigned tasks. The responsibility assignment matrix is created by intersecting the WBS with the program OBS. This intersection identifies the control account.

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schedule performance index (SPI): Ratio of work accomplished versus work planned, for a specified time period. The SPI is an efficiency rating for work accomplishment, comparing work accomplished to what should have been accomplished.

schedule variance (SV): The difference between the earned value and the planned value at any point in time (EV – PV).

statement of work (SOW): A description of product and service to be procured under contract; a statement of requirements.

to complete performance index (TCPI): A metric computed by dividing the value of the work remaining by the value of the budget or the ETC remaining.

undistributed budget: This is the budget that has been identified for a specific scope of work in the WBS, which has not yet been distributed to a control account.

variance at complete (VAC): The difference between budget at complete and estimate at complete.

work authorization document (WAD): A formal document from the program manager to a control account manager identifying scope of work and budget at a control account level. It is used by the control account manager to plan work packages. The scope of work is relatable to the contract either directly or by reference to the CWBS dictionary.

work breakdown structure (WBS): A product-oriented division of hardware, software, services, and other tasks that organizes, defines, and graphically displays the product to be produced as well as the work to be accomplished to achieve the specified product.

work breakdown structure dictionary: A document that describes the technical and cost content of each WBS element. Also identified in the dictionary are the WBS element number, SOW paragraph number, contract line-item number, and the WBS code for this element and the next higher element. The dictionary is prepared and maintained for the life of the project by the project manager's staff.

work packages (WP): Detailed short-span jobs, or material items, identified by the contractor for accomplishing work required to complete the contract.

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Appendix C

Resources

Web Resources

- www.pmi.org: PMI is the world's leading not-for-profit membership association for the project management profession, with more than a half-million members and credential holders in more than 185 countries. Their worldwide advocacy for project management is supported by globally recognized standards and credentials, extensive research programs, and professional development opportunities.
- www.dcma.mil: The Defense Contract Management Agency (DCMA) is the Department of Defense (DoD) component that works directly with Defense suppliers to help ensure that DoD, Federal, and allied government supplies and services are delivered on time, at projected cost, and meet all performance requirements.
- www.mycpm.org: PMI EVM Community of Practice is a knowledge-based component of the Project Management Institute. They are an international, nonprofit organization dedicated to the disciplines of project management and performance measurement to include Earned Value Management Systems (EVMS) and other initiatives.
- www.ansi.org: As the voice of the U.S. standards and conformity assessment system, the American National Standards Institute (ANSI) empowers its members and constituents to strengthen the U.S. marketplace position in the global economy while helping to assure the safety and health of consumers and the protection of the environment.
- www.deltek.com: Deltek IPM is an integrated suite of project management software applications for Government Contractors and Agencies that require a compliant solution for EIA-748 requirements, program controls, and earned value management (EVM).

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Here are some additional web references to assist with your EVM journey:

- National Defense Authorization Act 2010 Section 804:

  `www.gpo.gov/fdsys/pkg/PLAW-111publ84/html/PLAW-111publ84.htm`

- The Capital Programming Guide and OMB Circular A–11, Part 7:

  `www.whitehouse.gov/omb/circulars_a11_current_year_a11_toc/`

- Federal Acquisition Regulations:

  `www.acquisition.gov/?q=browsefar`

- Defense Federal Acquisition Regulations Supplement:

  `www.dcaa.mil/dfars.html`

- EIA-748-C EVMS Standard, TechAmerica:

  `http://webstore.ansi.org/RecordDetail.aspx?sku=SAE+EIA+748C-2013+(SAE+EIA748C-2013)`

- DOD EVM System Interpretation Guide:

  `www.acq.osd.mil/evm/docs/DoD%20EVMSIG.pdf`

- Work Breakdown Structure (WBS) MIL-STD-881C:

  `https://acc.dau.mil/adl/en-US/482538/file/61223/MIL-STD%20881C%203%20Oct%2011.pdf`

- IPMR DID (DI-MGMT-81861)

  `http://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=278901`

- NDIA PMSC documents:

  - Earned Value Management Systems Application Guide:

    `www.ndia.org/Divisions/Divisions/IPMD/Documents/NDIA_IPMD_Application_Guide_Rev_Jan272015.pdf`

  - Earned Value Management Systems Intent Guide:

    `http://www.ndia.org/Divisions/Divisions/IPMD/Documents/ComplementsANSI/NDIA_IPMD_Intent_Guide_Ver_C_April292014(a).pdf`

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- Intent Guide Appendix Compliance Map Template:

  www.ndia.org/Divisions/Divisions/IPMD/Documents/ComplementsANSI/NDIA_IPMD_Intent_Guide_Ver_C_AppendixApril292014(a).docx

- Earned Value Management System Acceptance Guide:

  www.ndia.org/Divisions/Divisions/IPMD/Documents/ComplementsANSI/NDIA_IPMD_EVMS_%20Acceptance_Guide_Rev_032413(b).pdf

- Integrated Baseline Review Guide:

  www.ndia.org/Divisions/Divisions/IPMD/Documents/ComplementsANSI/NDIA_IPMD_IBR_Guide_Rev_Feb062015.pdf

- Planning and Scheduling Excellence Guide (PASEG):

  www.ndia.org/Divisions/Divisions/IPMD/Documents/OtherDocuments/NDIA_IPMD_PASEG_v3_Mar092016.pdf

- Surveillance Guide:

  www.ndia.org/Divisions/Divisions/IPMD/Documents/WorkingGroups/NDIA_IPMD_Surveillance_Guide_Rev_2_July172015.pdf

Conferences

- **EVM World:** The EVM World Conference is a chance to learn about project performance techniques, including earned value management (EVM). The conference provides training, current topics from practicing professionals, access to world leaders in project performance management, networking, and the latest in software and consulting to make your program successful.
- **International Integrated Program Management Conference:** This is the premier conference focusing on earned value management, featuring guest speakers, professional educational seminars, tools tracks, topical workshops, and practice symposia.

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